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ABSTRACT

Males belonging to 4 low income ethnic groups contrasted with males of a middle income ethnic group were evaluated on problem-solving behaviors via Twenty Questions. Age was found to influence level of performance. The higher socioeconomic status (SES) males performed at a significantly greater level than the lower SES males. No differences among the experimental ethnic groups were found for problem solving. (Author/EL)

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by Sadie Grimmett

Demonstration and Research Center
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and

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ABSTRACT

Males belonging to four low income ethnic groups contrasted with males of a middle income ethnic group were evaluated on problem solving behaviors via Twenty Questions. Age was found to influence level of performance. The higher SES males performed at a significantly greater level than the lower SES males. No differences among the experimental ethnic groups were found for problem solving.

THE INFLUENCE OF ETHNICITY AND AGE ON SOLVING TWENTY QUESTIONS[1]

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The game, Twenty Questions has been described as requiring a class of problem solving responses similar to those needed in every day problem solving (Neimark and Lewis, 1967). Conceptually the problem solving repertoire includes categorizing the environmental information and imposing a strategy of thinking for attaining solution. Kagan (1965) has stated that these responses are influeced by conceptual tempo, the rate of reflecting upon the alternatives in the situation.

For efficient solving of Twenty Questions, the strategy required for increasing certainty of attaining solution is analogous to conservative focusing described by Bruner (1956). The strategy which decreases certainty would be testing each individual stimulus randomly; this thinking procedure is similar

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to the successive scanning strategy identified by Bruner (1956). Categorizing is the formation or identification of concepts by abstraction. Studies of strategy (Mosher and Hornsby, 1966; Neimark and Lewis, 1967; Odom, 1967; Tougas and Rowan, 1966) and of conceptual categorizing (Hess and Shipman, 1965; Reichard, Schneider, and Rapaport, 1944; Sigel, 1967;Szeminska, 1965) have demonstrated the effect of age and SES. Sex and ethnicity have also been found to influence categorizing of the stimuli (Greenfield, Reich, and Olver, 1966; Kagan, Rossman, Day Albert and Phillips, 1964; Wallach and Kogan, 1965; Youniss and Furth, 1967).

Conceptual tempo rate has been affected by age and sex (Kagan, et al., 1964) and ethnicity and SES (Coyle, 1966). Longer conceptual tempo rates have been associated with correct inductive reasoning (Kagan, Pearson, and Welch, 1966). The most frequent operational definition of conceptual tempo has been average latency to first response and error rate on the Matching Familiar Figures Test.

The data imply that problem solving behaviors are influenced by ethnic membership;yet, seldom have strategies of thinking, categorizing, and conceptual tempo been incorporated in a single study which assessed the impact of ethnicity. This study evaluated these variables via the task Twenty Questions in a comparison of four low income ethnic groups contrasted with a middle income ethnic group. Age was also an independent variable.

It was hypothesized that ethnoculture (ethnicity at a given SES) would foster unique patterns or different levels of conceptual categorizing, different frequencies of strategies, and different levels of conceptual tempo. Age was conjectured to be associated with mean differences in level of conceptual tempo and categorizing, and different frequencies of strategies.

Method

Subjects

The subjects (Ss) were 196 males distributed among five ethnocultures. Each of four ethnocultures -- Mexican-American (MA), Black-American (BA), Indian-American (IA), and middle class Caucasian-American (MCA) -- contained 40 Ss; the Appalachian Caucasian-American (AA) sample had 36 Ss. There were 156 males in the low income experimental samples (MA, IA, AA, and BA) and 40 males in the contrast sample (MCA). SES was determined by the occupation scale of the Index of Social Position (Hollingshead, 1957).

Table 1

Mean Ages of the Grade Levels

for Each Ethnoculture

Ethnoculture	Ages* Grade 3	Grade 6
MCA	107	141
AA	109	146
MA	103	144
BA	104	141
IA	103	141

*Reported in months

Each ethnocultural sample was divided equally between grades three and six; there were 98 Ss in each grade.

MA, IA, AA, and BA did not differ for mean standard score obtained on the vocabulary subtest of the Weschler Intelligence Scale for Children. There were no grade level differences for mean vocabulary standard score.

MA, IA, BA, and MCA Ss resided in Arizona; the AA Ss lived in Tennessee. The IA males were Papago Indians who were located approximately 50 miles from the nearest metropolitan area. The AA boys lived a similar distance from the nearest city. All IA and MA Ss lived in bilingual homes.

Materials

Thirty-five familiar objects were depicted in color singly on 3-in. by 3-in. cards. These stimuli were arranged in five contiguous columns, each column containing seven objects. The array could be grouped by such terms as measuring thing, burning thing, animal, brown thing, and etc. The center stimulus was always the correct solution.

A set of 12 pictures was presented in groups of 3, 4, and 5 on three cards. These sets were used in the familiarization procedure.

Two in tandem stopwatches attached to a clipboard recorded the latency. The verbal responses were tape recorded.

Procedures

Twenty Questions was administered to each S individually subsequent to warm-up which included question generation and a facsimile of the task procedure. On exposing the 35 stimuli, S was instructed to identify each picture. Following identification, S was instructed to determine the picture about which the experimenter was thinking in as few questions as possible. S was told that he could ask no more than 20 questions.

The questions that each S emitted were assigned to one of four categories. The specific hypothesis category contained questions which were applicable to one and only one stimulus in the array. The three remaining categories were description, function, and nominal which were defined similarly to the definitions used by Greenfield, et al.(1966). Descriptive, functional, and nominal questions conceivably grouped two or more of the pictured stimuli. Because

nominal questions were so infrequent, these questions were grouped with the function questions forming a N-F category. The frequency scores within each of the three categories for each S were transformed to arc sine scores.

The conservative focusing strategy was inferred from a pattern of three consecutive related questions. Any S who had this pattern among his questions was identified as using the conservative focusing strategy. Successive scanning was determined by specific hypotheses totaling one-half or greater of the total questions. A S who displayed this pattern and who did not have a sequence of related questions was classified as a successive scanner. Conceptual tempo rate was defined as latency to first response (LFR) the average latency per questions (QRT). LFR was the time between end of instructions and first response. QRT was computed by subtracting the first question from total questions and dividing the remainder into elapsed time from first to last questions. These measurements were recorded in thousandths of a minute.

Results

A repeated measures analysis of variance was applied to the transformed categorizing scores: the analysis yielded a significant interaction for grade by ethnoculture by category. Subanalyses of each category revealed a main effect of ethnicity for N-F which was attributable to MCA. MA, IA, AA, and BA did not differ significantly for any of the categories. Therefore, the hypothesis that the experimental ethnocultures would differ was not accepted.

Table 2

Means, Standard Deviations, and

F-Ratio for Each Conceptual Category

for Each Ethnoculture

	MCA		MA		BA		IA		AA		df	F
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD		
N-F	2.88	3.99	1.70	3.98	.75	1.56	1.25	3.17	.72	1.38	4/186	4.22*
Des	1.08	1.72	.82	1.58	.65	1.41	.53	1.60	.53	1.01	4/186	1.15
Spec. Hyp.	7.50	6.64	8.53	7.21	10.20	6.96	11.40	7.31	10.19	7.43	4/186	1.85

*$p < .01$

WithinSs analyses of each ethnoculture for each grade showed that MA and MCA sixth-graders obtained statistically equivalent means among the conceptual categories. For the other eight groups, the specific hypotheses category was significantly higher than the descriptive and N-F categories; these latter categories did not differ. While this result suggested ethnicity interacting with age affects the pattern of responses, the most conservative implication was that the category preferred by the ehtnocultures was specific hypothesis. The pattern of means earned by each ethnoculture contradicted that ethnicity fostered a unique pattern; therefore, this hypothesis was not accepted.

Differences in level of categorizing performance for the age groups disregarding ethnicity were in the expected direction. Eleven-year-olds asked significantly more N-F and descriptive questions than the eight-year-olds. The younger boys surpassed the older boys in emission of specific hypotheses. The prediction of differences between the grade levels was supported by these results.

Differences in frequencies of Ss in each of the experimental ethnocultures who used conservative focusing or successive scanning were assessed by $\underline{X}^2$ which revealed that MA, IA, AA, and BA were correlated groups. These groups were collapsed and contrasted with the frequency distribution for MCA Ss. The analysis resulted in a significant $\underline{X}^2$ ($p < .05$; 1 df) indicating that the proportion of conservative focusers was greater for middle SES. The hypothesis which predicted differences in proportion of MA, BA, AA, and IA boys using the conservative focusing strategy was not accepted.

Table 3

Distribution of Males Using Each Strategy

for Each Ethnoculture

	IA	AA	BA	MA	MCA
Conservative Focusing	7	5	9	10	13
Successive Scanning	32	30	30	28	22

Computation of the frequencies of boys in the age groups using the two strategies yielded $\underline{X}^2$ of 31.40. This result indicated that more older boys were significantly efficient in problem solving than younger boys. The hypothesis predicting age differences for strategy deployment was accepted.

Each of the conceptual tempo measures, LFR and QRT, were subjected to a grade by ethnoculture analysis of variance. The results of the LFR computation revealed a significant main effect of ethnoculture. Multiple comparisons of the five means showed that AA and IA delayed to first response emission significantly longer than BA, MA, and MCA. There were no other observed significant differences. The hypothesis predicting conceptual tempo rate differences for response time to first question was accepted. For QRT, the levels within the factors did not differ significantly.

Discussion

The hypothesized differences among MA, BA, IA, and AA for conceptual categorizing and strategy deployment on Twenty Questions were not supported by the results. The pattern of means for the conceptual categories revealed that these groups were similar in preference for stimulus-grouping modes.

Conceptual tempo analyses yielded inconsistent results. Latency to first response was longer for IA and AA whereas average latency per question did not differentiate the experimental ethnocultures. The observed conceptual tempo difference was between rural and urban groups. This finding may be indicating very subtle approach styles to handling alternative response possibilities associated with community differences. Because the other dependent variables were not significantly different for the experimental groups, the parsimonious interpretation of these data was that the low income ethnic groups did not differ in problem solving performance on Twenty Questions.

The observed ethnocultural difference favoring MCA for the N-F category and conservative focusing strategy was, in effect, a difference between SES levels. SES fostered different levels of conceptual categorizing for one category and a greater proportion of Ss who used conservative focusing.

Age was found to affect problem solving behaviors exclusive of conceptual tempo. It appears that accrued experiences accompanying age growth increases the level of problem solving performance. Failure to find age differences for conceptual tempo as well as ethnic differences for QRT may have been accounted for by methodology. The procedure in the current study diverged from the procedures used by Kagan (1965).

The lack of differences among the four low income ethnic groups was assumed to be attributable to the influence of low SES factors. However, the results of this study raise questions for further research on variables which may be attenuating ethnic effect on problem solving.

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